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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/681,853 | 10/06/2003 | J. Jeff Bonn | H0004421 | 7141 |

128 7590 10/17/2007
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| EXAMINER |
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SAM, SESNA

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| ART UNIT | PAPER NUMBER |
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4132

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| MAIL DATE | DELIVERY MODE |
| 10/17/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | |
|------------------------------|------------------------|---------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/681,853 | BONN ET AL. |
| | Examiner | Art Unit |
| | Sesna Sam | 4132 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on _____.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-20 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
 5) Claim(s) ____ is/are allowed.
 6) Claim(s) 1-20 is/are rejected.
 7) Claim(s) ____ is/are objected to.
 8) Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 06 October 2007 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

KHOI H. TRAN
 SUPERVISORY PATENT EXAMINER



Attachment(s)

- 1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date 10/06/2003.
- 4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____.
 5) Notice of Informal Patent Application
 6) Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claim 17, 18 are rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant regard as their invention.

As per claim 17 and 18, the word “ mass” should change to weight to properly reflect the claimed invention since mass remains constant regardless of vehicle position or attitude.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claim 1-9, 14, 15, 19, 20 are rejected under 35 U.S.C. 102(a) as being unpatentable by

Shultz (U.S. Pub. No. 2002/0145077 A1)

As per claim 1, Shultz discloses a control moment gyro (CMG) for use in a space vehicle, comprising:

- a rotor adapted to rotate around a first CMG axis (077' figure 2B, 124, paragraph [0025]);

- a gimbal supporting the rotor wherein the gimbal is able to rotate around a second CMG axis not parallel with the first axis (077' figure 2B, 214, 216);
- a base supporting the gimbal wherein the base is able to rotate around a third axis not parallel with the second axis (077' figure 2B, 128, paragraph [0027-0028]);
- a mechanism for locking and unlocking the base to prevent or permit rotation thereof around the third axis (077' figure 2B, 224, paragraph [0028]); and
- a drive mechanism coupled to the base for causing the base to rotate around the third axis when unlocked (077' figure 2B, 218, 225, paragraph [0027-0028]).

As per claim 2, the CMG further comprising a mount adapted to rigidly attach to the vehicle and moveably couple to the base, wherein the drive mechanism acts between the base and the mount (077' page 2, paragraph [0020]).

As per claim 3, Shultz discloses apparatus for controlling spacecraft (S/C) momentum using control moment gyros (CMGs), comprising:

an array of three or more CMGs (077' figure 1), each having a rotor adapted to rotate around a first axis (077' figure 2B, 124, paragraph [0025]); a gimbal supporting the rotor wherein the gimbal is able to rotate around a second axis not parallel to the first axis, and a base supporting the gimbal and rotor and able to rotate around a third axis not parallel to the second axis (077' figure 2B, 214, 216);

a releasable locking mechanism coupled to at least one of the CMGs for fixing the position of the base of the at least one CMG with respect to the spacecraft (770' figure 1, 130, 132);

a drive associated with the base of the at least one CMG and able to cause rotation or other movement of the base of the at least one CMG with respect to the S/C when the locking mechanism is released (077' figure 2B, 212, 225); and

a controller coupled to the drive and the locking mechanism for receiving reorientation requests directed toward the CMG array and issuing commands to the locking mechanism to release and to the drive to cause movement of the at least one CMG with respect to the third axis (077' figure 2B, 130).

As per claim 4, Shultz discloses the drive causes rotation of the at least one CMG around the third axis (077' figure 2B, 225, paragraph [0027]).

As per claim 5, Shultz discloses the drive causes rotation of the at least one CMG around the third axis and translation of the at least one CMG with respect to the S/C (077' figure 2B, 225, paragraph [0027]).

As per claim 6, Shultz discloses the drive is rotationally coupled between the S/C and the base of the at least one CMG so as to provide rotation of the base around the third axis (077' figure 2B, 225, paragraph [0027]).

As per claim 7, Shultz discloses the apparatus comprises a bearing coupled between the S/C and the base facilitating relative movement thereof (077' page 2, paragraph [0020]).

As per claim 8, Shultz discloses the locking mechanism is relocked after such movement (077' figure 2B, 225, paragraph [0028]).

As per claim 9, Shultz discloses the apparatus further comprises one or more sensors (077' figure 2B, 220, paragraph [0032]) coupled to the at least one CMG and the controller for

determining the amount of relative movement of the base of the at least one CMG with respect to the S/C (077' figure 2B, 130, paragraph [0029]).

As per claim 14, **Shultz** discloses a method of improving momentum control of a space vehicle by reorienting a control moment gyro (CMG) array, comprising:

- identifying which CMGs of the array are working (077' page 2, paragraph [0029]);
- determining an another array orientation having more favorable vehicle control characteristics (077' page 2, paragraph [0029]);
- releasing one or more locks fixing one or more of the CMGs in place in the array(077' page 2, paragraph [0029]);
- activating drive means for the one or more released CMGs to produce the another array orientation (077' page 2, paragraph [0029]); and
- engaging the one or more locks to once again fix the one or more CMGs in place in another array orientation (077' page 2, paragraph [0029]).

As per claim 15, **Shultz** discloses the method prior to the releasing step: determining the best vehicle state for array reorientation, and adjusting CMG momentum for minimum negative vehicle impact during reorientation of the array (077' page 3, [0038-0039]).

As per claim 19, **Shultz** discloses the method of step comprises determining more favorable control characteristics after failure of a CMG of the array (077' page 3, paragraph [0041]). Shultz shows a method for directing an object using gyroscopes.

As per claim 20, **Shultz** discloses the method of the determining step comprises at least in part, retrieving pre-planned array reorientation data from memory (077' figure 3C, page 3, paragraph [0036]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Shultz (U.S.**

Pub. No. 2002/0145077 A1) in view of applicant's admitted prior art in paragraph [0030]

As per claim 17-18, Shultz discloses all elements per claim invention as explained in
paragraph 2 above. However, it is silent as to the specifics of determining favorable vehicle control characteristics based on vehicle mass characteristics.

Applicant's admitted prior art in paragraph 0030 of the specification indicated that determining vehicle control characteristics based on vehicle mass is commonly well known.

It would have been obvious to one of the ordinary skill in the art to take into account Shultz's vehicle mass for favorable controls thereof because it facilitates commonly well known favorable vehicle control characteristics, as shown by applicant's admitted prior art.

4. Claim 10, 11, 12, 13, 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Shultz (U.S. Pub. No. 2002/0145077 A1)** in view of **Lie et al (U.S. Patent No. 6,285,927 B1)**

As per claim 10, **Shultz** discloses the limitation as set forth in paragraph 2, but it does not expressly disclose one or more sensors coupled to the S/C and to the controller for measuring one or more aspects of the S/C condition or attitude.

Lie et al discloses one or more sensors coupled to the S/C and to the controller for measuring one or more aspects of the S/C condition or attitude (927' abstract, column 1, lines 5-8). Lie et al shows the use of attitude sensor for calculating the corrected spacecraft attitude as a function of time between two values.

At the time of the invention was made, it would have been obvious to one of the ordinary skill in the art to have modified the dynamic CMG array of Shultz to include the attitude sensors for calculating the corrected spacecraft attitude, as taught by Lie et al.

As per claim 11, **Shultz** discloses a memory for rotating predetermined angle coupled (077' page 3, paragraph [0036]).

As per claim 12, **Shultz** discloses a CMG controller, but it does not expressly disclose the controller comprises a S/C attitude controller.

Lie et al discloses controller comprises a S/C attitude controller (927' column 1, lines 21-24). Lie et al shows the controller comprises a S/C attitude controller for performing dynamic maneuvers associated with time.

At the time of the invention was made, it would have been obvious to one of the ordinary skill in the art to have modified the dynamic CMG array of Shultz to include a controller comprises a S/C attitude controller for performing dynamic maneuvers associated with time, as taught by Lie et al.

As per claim 13, Shultz discloses one or more sensors coupled to the at least one CMG and the controller for determining the amount of rotation of the at least one CMG about the third axis (077' page 3, paragraph [0035-0036]). Shultz does not explicitly disclose one or more sensors coupled to the S/C and to the controller for measuring one or more aspects of the S/C condition or attitude and memory coupled to the controller for storing data concerning the at least one CMG.

Lie et al discloses one or more sensors coupled to the S/C and to the controller for measuring one or more aspects of the S/C condition or attitude (927' abstract, column 1, lines 5-8) and memory coupled to the controller for storing data concerning the at least one CMG (927' column 4, lines 1-9, lines 25-28). Lie et al shows the use of attitude sensor for calculating the corrected spacecraft attitude as a function of time between two values. Lie also shows a memory coupled to the controller for processing the attitude sensor data and update the spacecraft attitude.

At the time of the invention was made, it would have been obvious to one of the ordinary skill in the art to have provided the dynamic CMG array of Shultz to include a memory and attitude sensor for calculating data and controlling the spacecraft, as taught by Lie et al.

As per claim 16, Shultz does not disclose the method further comprises updating vehicle control parameters for another array orientation.

Lie et al discloses an updating vehicle control parameters for another array orientation (927' column 2, lines 12-24). Lie et al teaches an updating vehicle control parameters for another array orientation for updating the spacecraft attitude.

At the time of the invention was made, it would have been obvious to one of the ordinary skill in the art to have modified the dynamic CMG array of Shultz to include the method of updating the spacecraft attitude for the purpose of controlling spacecraft, as taught by Lie et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sesna Sam whose telephone number is (571) 270-3277. The examiner can normally be reached on Monday-Friday (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Khoi Tran can be reached on (571) 272-6919. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Date: 10/12/2007

Sesna Sam

KHOI H. TRAN
SUPERVISORY PATENT EXAMINER

